

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

REMARKS

Claims 1-24 are pending and being amended herein.

Claims 1-3 and 13-15 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Akiyama et al. (U.S. Pat. No. 5,176,310). The rejection is traversed and reconsideration is respectfully requested.

Akiyama et al. is directed to a ball bonding technique using an insulated wire in assembling a semiconductor chip in which the ball is formed at the end of an insulated wire by an electrical discharge, and the insulation at a portion of the wire to be bonded a predetermined distance from one end of the wire is removed by an electrical discharge.

A wire bonder is needed and used to perform the bonding operation. The wire bonder of Akiyama of course comprises a bondhead, a power module supplying electrical power for operating a drive of the bondhead, a control program and further elements. However, Akiyama does not disclose an emergency switch. The switches 18e and 18f are not emergency switches. They are customary switches disposed in a discharge power circuit 18 and controlled by the control program to apply a predetermined high voltage between the electrode piece 170b and the core wire 13a of the insulated wire 13 or to apply a predetermined low voltage from the low voltage generating unit 18g. In contrast to this, an emergency switch is by definition a switch that is pressed by a person in an emergency case. Furthermore Akiyama does not disclose

- a power switch for controlling the supply of electrical power by the power module to the drive,
- a control program that upon activation of the emergency switch completes the current bond cycle and then suspends the further wiring,
- a timer that opens the power switch after a predetermined period of time has elapsed wherein the predetermined period is sufficient to complete the current bond cycle.

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

From the above it follows that

- the structural elements of claim 1 define a wire bonder that structurally differs from the wire bonder disclosed by Akiyama, and
- the structural elements listed in claim 1 have different functions. The rejection of claim 1 under 35 U.S.C. 102(b) should therefore be withdrawn and claim 1 allowed.

The electrical power supply module of claim 2 is capable of storing electrical power and delivering this electrical power during a predetermined minimum period of time when the external electrical power supply breaks down and fails to work. The minimum period of time is so long that the wire bonder is able to complete the current bond cycle. Akiyama does not disclose an electrical power supply module having this capability.

Akiyama does not disclose a power sensor. Akiyama mentions speed detecting means and a position detecting means (column 7, lines 46 and 47). The speed detecting means and the position detecting means are used for detecting the movement of the bondhead. Akiyama further discloses a recognition device including a camera for detecting the bonding position on the semiconductor chip and the leadframe (column 7, lines 52-56). Akiyama further discloses an optical fiber sensor comprising a light emitting fiber and a light receiving fiber. This optical fiber sensor is used in the wire tensioning device to detect the presence of the insulated wire (column 9, lines 14-27). Akiyama does not disclose a power sensor and it does not disclose a sensor for detecting a possible interruption of the external power supply.

From the above it follows that it cannot be maintained that Akiyama anticipates claim 2 and the rejection of claim 2 under 35 U.S.C. 102(b) should be withdrawn and claim 2 allowed.

Akiyama does not disclose a wire bonder set up to instantaneously switch off all electrical consumers not required for completion of the current bond cycle when

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

the sensor reports an interruption of the external power supply. Therefore it cannot be maintained that Akiyama anticipates claim 3 and the rejection of claim 3 under 35 U.S.C. 102(b) should be withdrawn and claim 3 allowed.

The light curtain recited in claims 13-15 is a security means used to detect any access to the working area of the bondhead. A light curtain is a light barrier that extends in space. The optical fiber sensor of Akiyama is not a light curtain that measures the interruption of a light beam, it is a sensor that measures the light reflected by an object, i.e. the insulated wire. Therefore it cannot be maintained that Akiyama anticipates claims 13-15 and the rejection of claims 13-15 under 35 U.S.C. 102(b) should be withdrawn and claims 13-15 allowed.

Claims 1-6 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kising et al. (U.S. Pat. No. 5,637,947). The rejection is traversed and reconsideration is respectfully requested.

Kising concerns a method and apparatus for operating a generator supplying a high-frequency power to an ultrasonic transducer. It relates to a method for a unique control of the frequency and output power of a digital generator, in particular for an ultrasonic welding process. Based on a digital processing, the method compensates not only for variations of the resonant frequency in a broad range, but further provides to control a shifting of the resonant point during the welding process in response to temperature or pressure variations. Power variations caused by variations of the line supply voltage or by the pressure are detected and levelled out by the software. The software monitors the overall operation of in-line machinery, matches its parameters and monitors the complete cycle. The software further ensures an optimum efficiency and effectively protects the end stage against stress caused by high-reactive currents. Thus the Kising reference does not concern a wire bonder.

Applicant's claim 1, on the other hand, is directed to a wire bonder for wiring semiconductor chips, comprising

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

a bondhead,
a power module supplying electrical power for operating a drive of the
bondhead,
a power switch for controlling the supply of electrical power by the power
module to the drive,
a timer,
a control program, and
at least one emergency switch,
the at least one emergency switch producing upon activation a signal for causing the
control program to complete a current bond cycle and then suspend the further
wiring and for starting the timer, the timer opening the power switch after a
predetermined period of time has elapsed, the predetermined period being sufficient
to complete the current bond cycle.

Kising does not disclose any of these structural elements. The elements of
Kising are structurally different and used for another purpose. The master relay 21
of Kising allows to completely disconnect the line power supply from the line
supply (column 3, lines 24-27), especially when the current consumption of the line
power supply is too high (column 3, lines 24-27). Thus the master relay 21 is used in
another way to perform another function. It is not used to control the supply of
electrical power by the line power supply to the devices it supplies with power.

For at least the reasons set forth above it cannot be maintained that Kising
anticipates claim 1. The rejection of claim 1 under 35 U.S.C. 102(b) should therefore
be withdrawn and claim 1 allowed.

Claims 2-6 depend directly or indirectly from claim 1. As stated above in
reference to Applicants' claim 1, the Kising reference does not teach any of the
elements of claim 1. Thus, as claims 2-6 depend directly or indirectly from claim 1,
for at least the above-identified reasons, the Kising reference does not anticipate

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

claims 2-6 and the rejection of claims 2-6 under 35 U.S.C. 102(b) should be withdrawn and claims 2-6 allowed.

Claims 1-6 and 13-18 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Sugimoto et al. (U.S. Pat. No. 4,485,957). The rejection is traversed and reconsideration is respectfully requested.

Sugitomo discloses a wire bonder comprising a clasper for clamping a bonding wire and bonding wire disconnection detecting means for detecting the disconnection of the bonding wire in terms of the wire clamping state of the clasper. In order to detect highly accurately and reliably the disconnection of the bonding wire, the aforementioned bonding wire disconnection detecting means is characterized by the provision of a detecting unit for detecting a quantity which corresponds to the facing gap of the clasper during the clamping operation.

Sugitomo discloses a detection switch 21. However, this detection switch 21 is neither an emergency switch that is by definition a switch activated by a person in an emergency case nor a power switch for controlling the supply of electrical power by the power module to a drive of the bondhead. The detection switch 21 is turned on when it is intended to operate the disconnection detecting means which is used for detecting the disconnection of the bonding wire.

Sugitomo fails to disclose at least the following elements of claim 1:

a power switch for controlling the supply of electrical power by the power module to the drive,

a timer, and

at least one emergency switch,

wherein the at least one emergency switch produces upon activation a signal for causing the control program to complete a current bond cycle and then suspend the further wiring and starts the timer, the timer opening the power switch after a predetermined period of time has elapsed, the predetermined period being sufficient to complete the current bond cycle.

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

Therefore it cannot be maintained that Sugitomo anticipates claim 1. The rejection of claim 1 under 35 U.S.C. 102(b) should therefore be withdrawn and claim 1 allowed.

The electrical power supply module of claim 2 is capable of storing electrical power and delivering this electrical power during a predetermined minimum period of time when the external electrical power supply breaks down and fails to work. The minimum period of time is so long that the wire bonder is able to complete the current bond cycle. Sugitomo does not disclose an electrical power supply module having this capability. Furthermore, Sugitomo does not disclose a power sensor. From this it follows that it cannot be maintained that Sugitomo anticipates claim 2 and the rejection of claim 2 under 35 U.S.C. 102(b) should be withdrawn and claim 2 allowed.

Sugitomo does not disclose a wire bonder set up to instantaneously switch off all electrical consumers not required for completion of the current bond cycle when the sensor reports an interruption of the external power supply. Therefore it cannot be maintained that Sugitomo anticipates claim 3 and the rejection of claim 3 under 35 U.S.C. 102(b) should be withdrawn and claim 3 allowed.

Sugitomo discloses pressure sensors 23 and 24 such as piezoelectric elements that are attached to the respective facing sides of insulating members 12B and 13B, which in turn are attached to the lower ends of the clamping tips 7a and 8a, so that whether or not the wire is clamped can be detected in terms of the magnitude of the clamping force between the clamping tips 7a and 8a by the coactions of the pressure sensors 23 and 24. The pressure sensors 23 and 24 are not used to measure pressure in a pressure supply line. Therefore it cannot be maintained that Sugitomo anticipates claims 4-6. The rejection of claims 4-6 under 35 U.S.C. 102(b) should therefore be withdrawn and claims 4-6 allowed.

Sugitomo discloses a light emitting element 26 and a light receiving element 28 that form a light barrier between the clamping tips of the clasper. Thus the light

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

barrier of Sugitomo is not a light curtain provided around the working area of the bondhead in order to detect any access to the working area of the bondhead. Therefore it cannot be maintained that Sugitomo anticipates claims 13-18. The rejection of claims 13-18 under 35 U.S.C. 102(b) should therefore be withdrawn and claims 13-18 allowed.

Claims 7-12 and 19-24 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Sugimoto et al. (U.S. Pat. No. 4,485,957). The rejection is traversed and reconsideration is respectfully requested.

Claims 7-12 and 19-24 depend directly or indirectly from claim 1. As stated above in reference to Applicants' claim 1, the Sugitomo reference does not teach the elements of claim 1.

Furthermore the vacuum sensor of the present invention is not used to control the wire feeding and positioning. Therefore it is not obvious to add a vacuum sensor and a vacuum tank to the wire bonder of Sugitomo for guaranteeing the supply of vacuum to the wire bonder for a minimum predetermined period of time and to cause the control program to complete the current bond cycle and then suspend the further wiring when the vacuum falls below a predetermined value.

Thus, for at least this reason and as claims 7-12 and 19-24 depend directly or indirectly from claim 1, for at least the above-identified reasons, the Sugitomo reference does not anticipate claims 7-12 and 19-24 and the rejection of claims 7-12 and 19-24 under 35 U.S.C. 103(a) should be withdrawn and claims 7-12 and 19-24 allowed.

Claims 4-6, 10-12 and 16-18 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Akiyama et al. (U.S. Pat. No. 5,176,310) in view of Asanasavest (U.S. Pat. No. 5,230,458). The rejection is traversed and reconsideration is respectfully requested.

Asanasavest provides a real time feedback interconnect system which allows real-time detection and control of bond force exerted on the bond site. A force

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

sensor is provided in the bond system, which detects the bond force exerted by the bond tool. The force sensor provides a force signal to a real-time feedback circuit. The feedback circuit transmits a force adjustment signal to a z-motion actuator to adjust the force applied to the bond site.

The pressure sensor of claims 4-6 is used to detect when the pressure in a pressure supply line falls below a predetermined value and if that happens to stop the wire bonder after completion of the current bond cycle. Asanasavest does not disclose a pressure sensor for this task and a control program programmed to complete the current bond cycle and then suspend the further wiring.

The person skilled in the art has no motivation or suggestion to modify the wire bonder of Asanasavest. Moreover, the modification of the wire bonder of Asanasavest and its combination with the wire bonder of Akiyama would not result in the construction as is recited in claims 4-6. In view of the foregoing, Applicant's claims 4-6 are not obvious in view of Akiyama in combination with Asanasavest, and therefore the rejection of claims 4-6 under 35 U.S.C. 103(a) should be withdrawn and claims 4-6 allowed.

The vacuum sensor of claims 10-12 is used to detect when the vacuum falls below a predetermined value and if that happens to stop the wire bonder after completion of the current bond cycle. The wire bonder is equipped with a vacuum tank in order that vacuum can still be delivered until the current bond cycle is completed. Asanasavest does not disclose a vacuum sensor and a vacuum tank and a control program programmed to complete the current bond cycle and then suspend the further wiring upon failure of the vacuum.

The modification of the wire bonder of Asanasavest and its combination with the wire bonder of Akiyama would not result in the construction as is recited in claims 10-12 and 16-18. In view of the foregoing, Applicant's claims 10-12 and 16-18 are not obvious in view of Akiyama in combination with Asanasavest, and therefore

Application No.: 10/802,205
Office Action Dated: March 13, 2006
Response to Office Action Dated: June 5, 2006

the rejection of claims 10-12 and 16-18 under 35 U.S.C. 103(a) should be withdrawn and claims 10-12 and 16-18 allowed.

In view of the foregoing, it is respectfully submitted that amended claims 1-24 are in condition for allowance. All issues raised by the Examiner having been addressed, an early action to that effect is earnestly solicited.

No fees or deficiencies in fees are believed to be owed. However, authorization is hereby given to charge our Deposit Account No. 13-0235 in the event any such fees are owed.

Respectfully submitted,

By *Daniel G. Mackas*
Daniel G. Mackas
Registration No. 38,541
Attorney for Applicants

McCORMICK, PAULDING & HUBER LLP
CityPlace II, 185 Asylum Street
Hartford, CT 06103-3402
(860) 549-5290